What is claimed is:

1. A electrochemical cassette comprising at least one electrochemical cell which comprises:

a composite membrane electrode assembly (MEA) having a molded gasket bonded to the periphery of the MEA, wherein the gasket comprises at least one reactant manifold opening extending through the thickness thereof and at least one sealant channel or port;

a fuel flow field, an oxidant flow field, and a separator plate, each component having at least one reactant manifold opening extending through the thickness thereof;

wherein the one or more composite MEA, the oxidant flow field, the fuel flow field, and the separator plate are assembled and encapsulated about the periphery thereof by a sealant; and

wherein the sealant contemporaneously seals the respective channels to selectively block those reactant manifold openings which are not intended to deliver material to a particular flow field.

2. The electrochemical cassette of claim 1, wherein cassette further comprises at least one coolant flow field and wherein each membrane electrode assembly and each plate further comprise at least one coolant manifold opening wherein each coolant manifold opening extends through the thickness of the cassette.

3. The electrochemical cassette of claim 1 or claim 2, wherein a separator plate and one or two flow fields are integrated into a bipolar plate.

4. The electrochemical cassette of claim 3, wherein each bipolar plate has zero or one oxidant flow field and has zero or one fuel flow field.

5. The electrochemical cassette of claim 1, wherein each membrane electrode assembly is in contact with a fuel flow field and an oxidant flow field.

6. The electrochemical cassette according to any one of claims 1 through 5, wherein the electrochemical cassette is a fuel cell cassette.

7. The electrochemical cassette of any one of claims 1 through 6, wherein each composite MEA comprises:

a MEA comprising an ion conductive layer interposed between two gas diffusion layers which comprise a catalyst, and

a molded gasket bonded to the periphery of the MEA.

8. The electrochemical cassette of claim 7, wherein the composite MEA comprises a molded gasket which interpenetrates a portion of the gas diffusion layers of the MEA.

9. The electrochemical cassette according to claim 8, wherein a separator plate and one or two flow fields are integrated into a bipolar plate and each flow field comprises a series of ridges or protrusions etched in the surface of the bipolar plate.

10. The electrochemical cassette according to claim 3, wherein at least one bipolar plate comprises a coolant flow field.

11. The electrochemical cassette of claim 3, wherein a first bipolar plate comprises a first coolant flow field and a second bipolar plate which are aligned to form a coolant passage.

12. The electrochemical cassette of any one of claims 1 through 11 wherein at least one surface of at least one separator plate has one or more sealant channels.

13. The electrochemical cassette of claim 12, wherein at least a portion of the bipolar plate sealant channels is adjacent to the gasket of the membrane electrode assembly.

14. The electrochemical cassette of claim 13, wherein the sealant channel is adjacent to the interface of the gasket and the membrane electrode assembly.

15. The electrochemical cassette of any one of claims 1 through 14, wherein at least one sealant channel is interposed between each membrane electrode assembly and each plate or between adjacent plates.

16. The electrochemical cassette according to any one of claims 1 through 15, wherein the molded gasket is composed thermoset or thermoplastic material.

17. The electrochemical cassette according to any one of claims 1 through 16, wherein the sealant is a thermoset or a thermoplastic material.

18. The electrochemical cassette of any one of claims 16 or 17, wherein the thermoplastic material is selected from the group consisting of thermoplastic olefin elastomers, thermoplastic polyurethane, plastomer, polypropylene, polyethylene, polytetrafluoroethylene, fluorinated polypropylene and polystyrene.

19. The electrochemical cassette of claim 16 or 17, wherein the thermoset material is selected from the group consisting of epoxy resins, urethanes, silicones, fluorosilicones, and vinyl esters.

20. The electrochemical cassette of claim 19, wherein the thermoset material has a viscosity of between about 10,000 and 150,000 cP.

21. The electrochemical cassette of claim 19, wherein the thermoset material has a viscosity of between about 10,000 and 55,000 cP.

22. The electrochemical cassette of claim 3, wherein the bipolar plate is machined or molded out of at least one of a carbon/polymer composite, graphite or metal.

23. The electrochemical cassette of claim 3, wherein the bipolar plate is stamped from a metal sheet.

24. The electrochemical cassette of claim 1, wherein at least a portion of the sealant channels open to the peripheral edge of one or more plates of the cassette such that the sealant is introduced into the sealant channel during encapsulation of the cassette.

25. The electrochemical cassette of claim 1, wherein each membrane electrode assembly and plate further comprises at least one sealant hole extending through the thickness thereof, and wherein the sealant holes are in contact with at least a portion of one or more sealant channels.

26. The electrochemical cassette of claim 25, wherein at least a portion of the sealant channels are open to the peripheral edge of one or more composite MEAs or plates of the cassette.

27. The electrochemical cassette of claim 26, wherein the sealant is introduced into the fuel cell cassette through one or more of the sealant holes or through the sealant channel openings about the periphery of the plates.

28. The electrochemical cassette of claim 27, wherein the sealant is introduced by pressure assisted resin transfer or by vacuum assisted resin transfer.

29. The electrochemical cassette of claim 28, wherein the sealant or resin is introduced under a pressure differential of between about +15psi and about –15psi.

30. The electrochemical cassette of claim 28, wherein the sealant is introduced by pressure assisted resin transfer under a positive pressure of between 0 psi and about 50 psi.

31. The electrochemical cassette of claim 28, wherein the sealant or resin is introduced by vacuum assisted resin transfer under a partial pressure of between about 750 Torr and about 1 mTorr.

32. A fuel cell stack comprising:

(a) at least one electrochemical cassette according to any one of claims 1 through 31;

(b) at least one end plate having one or more openings which align with the reactant manifold opening(s);

wherein the end plate is assembled on the top and/or bottom of the stack of one or more electrochemical cassettes such that the openings in the end plate align with the fuel manifold openings, the oxidant openings, and optionally the coolant manifold openings.

33. The fuel cell stack of claim 32, wherein the end plate is assembled with the electrochemical cassette(s) prior to encapsulation and prior to introduction of the sealant such that the end plate and fuel cell cassettes(s) are encapsulated and sealed in combination.

34. The fuel cell stack of claim 33, wherein a compression means is applied to the stack to provide additional compressive force to the fuel cell stack.

35. The fuel cell stack of claim 33, wherein the end plate is attached to one or more electrochemical cassettes after encapsulation of the electrochemical cassette(s).

36. The fuel cell stack of claim 33, wherein the end plate is attached by a compressive seal.

37. The fuel cell stack of claim 33, wherein at least one of the end plates is composed of a thermoset polymer, a thermoplastic polymer, a metal, or a metal alloy.

38. The fuel cell stack of claim 33, wherein at least one of the end plates is composed of a filled polymer composite.

39. The fuel cell stack of claim 38, wherein the filled polymer composite is a glass fiber reinforced thermoplastic or a graphite reinforced thermoplastic.

40. A composite membrane electrode assembly (MEA) having a molded gasket bonded to the periphery of the MEA, wherein the gasket comprises at least one reactant manifold opening extending through the thickness thereof and at least one sealant channel or port and wherein the MEA comprises an ion conductive material interposed between two gas diffusion layers.